CLAIMS

1. A process for producing an α-hydroxycarboxylic acid ester comprising Steps 1 to 3:

Step 1. reacting, in the presence of oxygen, (i) a 1,2-diol with a 1,2-diol or (ii) a 1,2-diol with an alcohol to obtain a reaction product containing an α-hydroxycarboxylic acid ester;

Step 2. separating the α-hydroxycarboxylic acid ester from the reaction product obtained in Step 1 by distillation under reduced pressure; and

Step 3. feeding Step 1 with a mixture obtained by partially or entirely removing water from the reaction product, wherein the mixture contains an unreacted 1,2-diol and/or alcohol.

2. A process according to Claim 1, wherein the distillation of Step 2 is conducted at a pressure of 13 to 80000 Pa and a temperature at the bottom of a distillation column of 30 to 250°C.

3. A process according to Claim 1, wherein the mixture in Step 3 contains water in a proportion of 0 to 20 wt.%.

4. A process according to Claim 1, wherein when Steps 1 to 3 are in steady state, the reaction ingredients in Step 1 contain water in a proportion of 0.1 to 15 wt.%.

5. A process according to Claim 1, wherein in

Step 3 at least 30 wt.% of water based on the total weight of water is removed and fed to Step 1.

6. A process according to Claim 1, wherein in the distillation of Step 2 the reaction product obtained in Step 1 is formed into a thin film and heated by contacting the thin film with a heating surface.

7. A process according to Claim 1, wherein the reaction of Step 1 is conducted in the presence of a catalyst comprising a carrier and fine particles of a noble metal supported on the carrier.

8. A process according to Claim 1, wherein the reaction of Step 1 is conducted by further adding an α-hydroxycarboxylic acid and/or α-hydroxycarboxylic acid ester oligomer.

9. A process according to Claim 1, wherein a solution obtained at the bottom of a distillation column containing at least one reaction by-product selected from the group consisting of α-hydroxycarboxylic acids and α-hydroxycarboxylic acid ester oligomers generated in Step 1 and/or Step 2 is fed to Step 1 and/or Step 2.

10. A process according to Claim 1, wherein a 1,2-diol and an alcohol are reacted in Step 1.

11. A process according to Claim 10, wherein the reaction of Step 1 is conducted by further adding at least one member selected from the group consisting of α-

hydroxycarboxylic acids, α-hydroxycarboxylic acid 2-hydroxyalkyl esters, and α-hydroxycarboxylic acid ester oligomers.

12. A process according to Claim 10, wherein the reaction of Step 1 is conducted in the presence of a catalyst comprising a carrier and fine particles of a noble metal supported on the carrier.

13. A process according to Claim 10, wherein in Step 2 a fraction containing the α-hydroxycarboxylic acid ester is collected from a sidecut part.

14. A process according to Claim 10, wherein a solution obtained at the bottom of a distillation column containing at least one reaction by-product selected from the group consisting of α-hydroxycarboxylic acids, α-hydroxycarboxylic acid 2-hydroxyalkyl esters and α-hydroxycarboxylic acid ester oligomers generated in Step 1 and/or Step 2 is provided in Step 1 and/or Step 2.

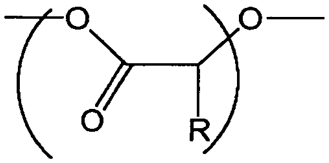
15. A process according to Claim 10, wherein a solution obtained at the bottom of a distillation column containing an α-hydroxycarboxylic acid ester oligomer generated in Step 1 and/or Step 2 is contacted with an alcohol R-OH corresponding to the ester group -C(=O)OR of the oligomer, whrein R is an organic residue, and then reused in Step 1 and/or Step 2.

16. A process according to Claim 10, wherein the

1,2-diol is ethylene glycol and the α-hydroxycarboxylic acid ester is a glycolic acid ester.

17. An α-hydroxycarboxylic acid condensate selected from (I) to (III) below:

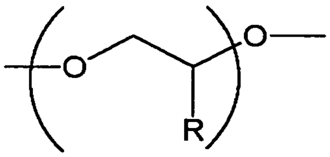
(I) an α-hydroxycarboxylic acid condensate having an α-hydroxycarboxylic acid condensate portion represented by General Formula 2:



(2)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted and

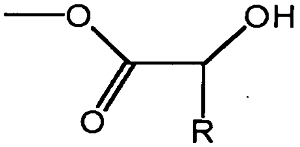
a 1,2-diol chain represented by General Formula 3:



(3)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted,

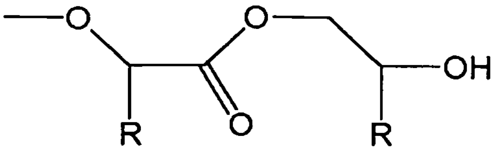
both terminals being represented by General Formula 4:



(4)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted, or

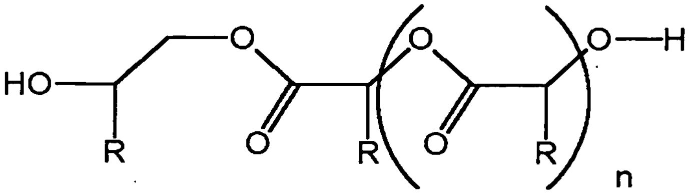
General Formula 5:



(5)

wherein each R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted;

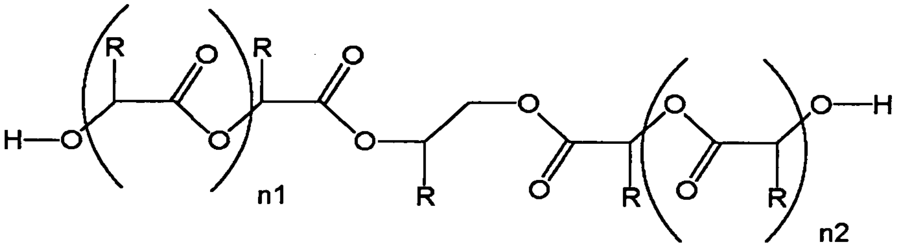
(II) an α-hydroxycarboxylic acid condensate represented by General Formula 6:



(6)

wherein each R is hydrogen or C_{1-5} alkyl, the alkyl may be substituted, and n is within the range of 1 to 200; and

(III) an α-hydroxycarboxylic acid condensate represented by General Formula 7:

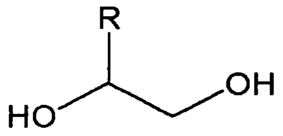


(7)

wherein each R is hydrogen or C_{1-5} alkyl, the alkyl may be substituted, both n1 and n2 are 1 or more, and n1 + n2 is within the range of 2 to 200.

18. An α-hydroxycarboxylic acid condensate

obtained by condensing, through a 1,2-diol eliminating reaction of an α-hydroxycarboxylic hydroxyalkyl ester prepared according to a process for producing an α-hydroxycarboxylic acid ester comprising reacting, in the presence of a catalyst, 1,2-diols represented by General Formula 1:

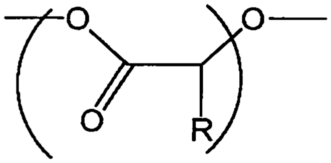


(1)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted,

the α-hydroxycarboxylic acid condensate being selected from (I) to (III) below:

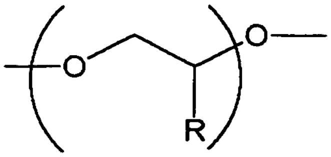
(I) an α-hydroxycarboxylic acid condensate having an α-hydroxycarboxylic acid condensate portion represented by General Formula 2:



(2)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted and

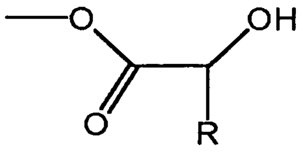
a 1,2-diol chain represented by General Formula 3:



(3)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted,

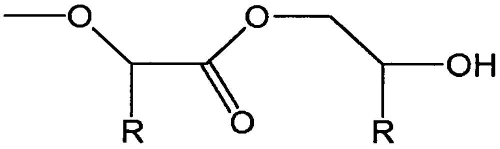
both terminals being represented by General Formula 4:



(4)

wherein R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted, or

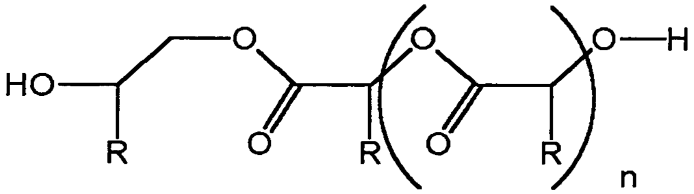
General Formula 5:



(5)

wherein each R is hydrogen or C_{1-5} alkyl, and the alkyl may be substituted;

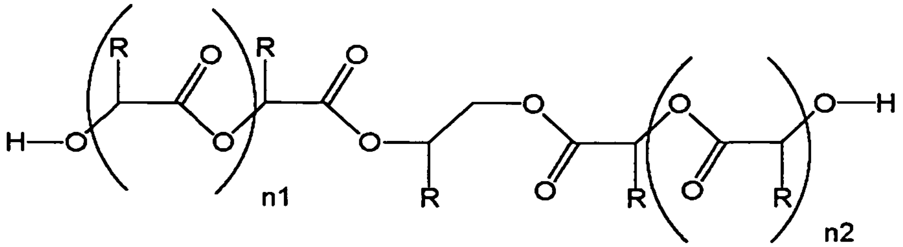
(II) an α-hydroxycarboxylic acid condensate represented by General Formula 6:



(6)

wherein each R is hydrogen or C_{1-5} alkyl, the alkyl may be substituted, and n is within the range of 1 to 200; and

(III) an α-hydroxycarboxylic acid condensate represented by General Formula 7:



(7)

wherein each R is hydrogen or C_{1-5} alkyl, the alkyl may be substituted, both n1 and n2 are 1 or more, and n1 + n2 is within the range of 2 to 200.